Release notes for ENDF/B Development n-097_Bk_245 evaluation

April 26, 2017

- `fudge-4.0` Warnings:

  1. Cross section does not match sum of linked reaction cross sections
     crossSectionSum label 0: total (Error # 0): CS Sum.

     ```
     WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.41%
     ```

  2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 2 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (2.638420e-09) is too small
     ```

  4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 4 (n + Bk245): / Form 'eval': / Component 0 (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 4 (n + Bk245): / Form 'eval': / Component 1 (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

  8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
     Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.

     ```
     WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
     ```

9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 9 (n + (Bk245_e1 ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (2.847091e-09) is too small
```

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 10 (n + (Bk245_e2 ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (3.135400e-10) is too small
```

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 11 (n + (Bk245_e3 ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (2.225905e-09) is too small
```

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 12 (n + (Bk245_e4 ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (5.346632e-10) is too small
```

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 13 (n + (Bk245_e5 ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (2.655691e-09) is too small
```

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 14 (n + (Bk245_c ->Bk245 + gamma)): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 15 (Bk246 + gamma): / Form 'eval': / Component 0 (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 15 (Bk246 + gamma): / Form 'eval': / Component 1 (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

18. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 16 (n + Bk245 [angular distribution]): / Form 'eval': (Error # 1): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

19. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 17 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

20. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 18 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

21. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 19 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

22. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 20 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.

```
WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
```

- `fudge-4.0` Errors:

1. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Decay product: gamma__a / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (140000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
```

2. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (140000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (200000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
       ... plus 1 more instances of this message
```

3. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Decay product: gamma__b / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
```

4. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Decay product: gamma__c / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (200000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
```

5. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Decay product: gamma__d / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
```

6. Energy range of data set does not match cross section range
reaction label 6: n + (Bk245_c ->Bk245 + gamma) / Product: Bk245_c / Decay product: gamma__e / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (101944.0 -> 20000000.0)
```

7. Calculated and tabulated Q values disagree.
reaction label 7: n[multiplicity:'2'] + Bk244 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: -7087828.217346191 eV vs -6971370. eV!
```

8. Calculated and tabulated Q values disagree.
reaction label 8: n[multiplicity:'3'] + Bk243 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: -13134820.92092896 eV vs -1.30184e7 eV!
```

9. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'3'] + Bk243 + gamma / Product: gamma__a / Multiplicity: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13071900.0 -> 20000000.0)
```

10. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'3'] + Bk243 + gamma / Product: gamma__a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

```
WARNING: Domain doesn't match the cross section domain: (13500000.0 -> 20000000.0) vs (13071900.0 -> 20000000.0)
```

11. Calculated and tabulated Q values disagree.
reaction label 10: Bk246 + gamma (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 5801868.281005859 eV vs 5918330. eV!
```

12. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 8: n + (Bk245_c ->Bk245 + gamma) total gamma multiplicity (Error # 0): summedMultiplicityMismatch

```
WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 26.96%
```

13. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 9: n[multiplicity:'3'] + Bk243 + gamma total gamma multiplicity (Error # 0): summedMultiplicityMismatch

```
WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 100.00%
```

14. Calculated and tabulated Q values disagree.
fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 229217305868.6241 eV vs 2.151617e8 eV!
```

15. Calculated and tabulated Q values disagree.
fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 229217305868.6241 eV vs 2.151617e8 eV!
```

16. Calculated and tabulated Q values disagree.
fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 229217305868.6241 eV vs 2.151617e8 eV!
```

17. Calculated and tabulated Q values disagree.
fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 229217305868.6241 eV vs 2.151617e8 eV!
```

18. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.
Section 16 (n + Bk245 [angular distribution]): / Form 'eval': / LegendreLValue L=1 vs 1 (Error # 0): Bad evs

```
WARNING: 10 negative eigenvalues! Worst case = -3.632988e-04
```

- `njoy2012` Warnings:

1. Evaluation has no resonance parameters given
unresr...calculation of unresolved resonance cross sections (0): No RR

```
 ---message from unresr---mat 9740 has no resonance parameters
                          copy as is to nout
```

2. In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in File 3, but no corresponding distributions are given. In these cases, it is assumed that MT=18 should be used for the fission neutron distributions.
heatr...prompt kerma (0): HEATR/hinit (3)

```
 ---message from hinit---mt19 has no spectrum
                         mt18 spectrum will be used.
```

3. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (1): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 16 does not give recoil za= 97244
                         one-particle recoil approx. used.
```

4. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (2): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 17 does not give recoil za= 97243
                         one-particle recoil approx. used.
```

5. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (3): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 51 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

6. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (4): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 52 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

7. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (5): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 53 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

8. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (6): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 54 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

9. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (7): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 55 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

10. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (8): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt 91 does not give recoil za= 97245
                         one-particle recoil approx. used.
```

11. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (9): HEATR/hinit (4)

```
 ---message from hinit---mf6, mt102 does not give recoil za= 97246
                          photon momentum recoil used.
```

12. There is a problem with the fission energy release.
heatr...prompt kerma (24): HEATR/nheat (3)

```
 ---message from nheat---changed q from   2.151617E+08 to   2.024046E+08
                          for mt  18
```

13. Evaluation has no resonance parameters given
purr...probabalistic unresolved calculation (0): No RR

```
 ---message from purr---mat 9740 has no resonance parameters
                          copy as is to nout
```